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TRANSLATION

INSOLUBLE RESIDUES, FORMING DURING THE HEATING OF JET FUELS

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G. F. Bol'shakov

When heating fuels, having insufficient thermo oxidation stability, are formed insoluble residues. The process of formation of insoluble residues is intensified by certain metals.

The purpose of this work was to investigate the composition of insoluble residues, forming during the heating of jet fuels in contact with metals.

For the investigation were taken the following fuels: No.1 TS-1 fuel, hydrogenated, with a total sulfur content of 0.011%; No. 2-TS-1 fuel, commercial, with total sulfur content of 0.16%, mercaptan content 0.007%; 3-TS-1 fuel, commercial, with total

sulfur content of 0.065%, mercaptan content-0.003%.

Fuels in contact with metals were tested for a period of 6 hours at 150° by the method developed by us (1).

Table 1

Effect of various metals on thermooxidation stability of jet fuels.

1 № топлива	2 Отношение поверхности металла к объему топлива, $см^2/см^3$	3 Нерастворимый в топливе осадок, мг/100 мл	4 Коррозия, $г/м^2$	5 Отложения на металле, $г/м^2$
	6 Бронза ВБ-24			
1	1:16	0,6	0	1,6
	1:3	2,3	0,6	5,2
2	1:16	2,4	2,0	5,4
	1:3	10,0	8,5	8,1
3	1:16	2,0	1,3	5,0
	1:3	9,0	5,0	7,6
	7 Латунь Л-62			
1	1:16	0,5	0,20	0,15
	1:3	2,0	0,25	0,15
2	1:16	1,0	0,35	0,30
	1:3	2,6	0.45	0,26
3	1:16	0,9	0,25	0,20
	1:3	2,5	0,40	0,20
	8 Сталь 12ХН3А			
1	1:1	0,1	Отсутствует	
2	1:1	0,5	»	
3	1:1	0,3	»	
	9 Дюралюминий Д1Т			
1	1:16	0,3	+5,1	1,00
	1:3	0,2	+2,7	0,23
2	1:16	0,8	+4,0	0,50
	1:3	0,5	+1,2	0,12
3	1:16	0,9	+2,7	0,26
	1:3	0,4	+1,7	0

1. No. of fuel.
2. Metal surface ratio to volume of fuel
3. Insoluble in fuel residue
4. Corrosion
5. Deposits on metal
6. Bronze VB
7. Brass-L
8. Steel 12 KHN3A
9. Duralumin D1T

Test results are given in Table 1. It is evident from Table 1 that copper alloys (bronze and brass) accelerate the autooxidation processes of fuels, promoting the formation of deposits on the metal, and increase the corrosion activity of the fuels. The catalytic effect of bronze VB-24 (Cu $\cong$ 75%; Zn $\cong$ 24%) and of brass L-62 (Cu $\cong$ 60%; Zn $\cong$ 40%) is explained to a large extent by the presence of copper. An increase in specific contact area of bronze and brass with the fuel also leads to a considerable reduction in its stability.

Duralumin D1T and especially steel 12KHN3A produce a much lesser effect on heated fuel, than bronze and brass. With an increase in contact surface of the fuel with Duralumin was observed a reduction in contact with metals.

The residues were washed off from the fuel with isopentane, dried at 100-105°, after which it was subjected to elementary analysis. The composition of the ashes was determined by spectral emission analysis (2) on a hilger* system apparatus.

From Table 2 is evident, that metals not only catalytically accelerate residue formation, but even they themselves do actively participate in these processes. In the ashes of the residues, forming during the heating of fuels with bronze, was found much copper, and during the heating with steel and Duralumin - a considerable amount of iron and aluminum.

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*Spectral analysis was made by Ye. A. Smirnov.

When insoluble residues are formed in fuels, in addition to sulfurous and other hetero-organic compounds (3,4,5) a highly active role is played by ash elements present in the fuel.

Table 2

Composition of insoluble residues (%weight), forming during the heating of fuel No. 2.

Состав (1)	(2) При контакте топлива с		
	(3) бронзой ВБ-24	(4) дюралюминием Д1Т	(5) сталью 12ХН3А
Углерод 6	28,99	27,09	26,96
Водород 7	5,96	8,38	9,62
Сера 8	6,01	7,48	7,80
Азот 9	1,08	0,39	0,73
Зола 10	8,21	4,35	4,81
«Зольные» элементы: 11			
кремний 12	0,3—1,0	0,3—1,0	0,3—1,0
алюминий 13	0,03—0,1	3—10	0,03—0,01
магний 14	0,03—0,1	0,03—0,1	0,3—1,0
кальций 15	0,3—1,0	0,3—0,1	0,03—0,1
железо 16	0,003—0,01	0,3—1,0	3—10
марганец 17	0,001—0,003	0,001—0,003	0,01—0,03
титан 18	0,001—0,003	0,1—0,3	0,01—0,03
медь 19	3—10	0,01—0,03	0,001—0,003

1. Composition
2. During contact of fuel with
3. bronze VB-24
4. Duralumin D1T
5. Steel 12KHN3A
6. Carbon
7. Hydrogen
8. Sulfur
9. Nitrogen
10. Ash
11. "Ash elements"
12. Silicon
13. Aluminum
14. Magnesium
15. Calcium
16. Iron
17. Manganese
18. Titanium
19. Copper

As confirmation of this appears to be the fact, that a greater part of inorganic elements, present in the initial fuels, was discovered in the ash part of residues insoluble in fuel.

Fimer particles of metal corrosion products and of dust from the atmosphere, falling into the fuel, appear to be as centers, around which aggregate particles of oxidized high-molecular heteroorganic compounds. Removal of ashes and other elements from the fuel composition would lead to a slowing down of residue formation processes in fuels.

Literature

1. P. I. Davydov, and G. F. Bol'shakov. Chemistry and Technology of Fuels and oils. No. 10, 1960.

2. Approximate qualitative spectral analysis of mineral raw material. Bried report under editorship of M. P. Kler. Gosgeoltekhizdat, 1959.

3. Exploitation properties of jet fuels at higher temperatures. Coll. of rep. under editor ship of prof. Chertkov. Ya. B. GOSINTI, 1958.

4. P. I. Davydov. Bol'shakov. G. F. Chem. and technol. of fuels and oils. No. 5, 1961.

5. G. F. Bol'shakov and Ye. A. Gleobowskava. Hateroorganic compounds of jet fuels. Gostoptekhizdat, 1962.